Firm Specific Measures of Innovation

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Current State of Innovation:

Innovation as an intuitive and creative process is a difficult process to measure. Innovation, which is considered an art, historically is measured in terms of financials or counts. Innovation, being a complex and unknown process, proves to be a challenge when defining clear and correlating measurements. The financial- type measurements include new product- or service-specific sales or revenue growth, and count-type measurements include items like the number of patents, trademarks, articles, and product or service versions produced. However, experience shows these measurements do not correlate to the innovation activity; therefore they should not be used as a business measure of performance.

In order to establish measures of innovation, understanding the innovation process first is a must. Corporations implement innovation through the network-centric, pipeline-fed, and opportunity-driven approaches. The network-centric approach, which is taught in colleges, is based on collaborative brain-storming. The concept is that more minds are better than one at a given time (without understanding the "why"). The pipeline model is driven by inventors who work in a research and development environment on a specific topic, explore new ideas and develop new products and services. The pipeline model, which is driven by chance or innate genius, is a somewhat common perception of the innovation process.

The opportunity-driven model is more representative of street-smart individuals who take an idea at the right time and the right place, devise a solution, know how to market it, and capitalize on their breakthrough. They also appear to be lucky, which is defined as an

intersection of continual preparation and opportunity. Their success represents a once-in-a-lifetime windfall out of the blue sky (i.e., fortuitous occurrences). Another innovation process, which is a combination of collaboration and opportunity, is called the "open innovation" process and leads to products such as Linux and the Internet.

Difficulty with Current Innovation Measures

Existing variants of the innovation process and its outcome are difficult to measure. Peter Drucker's process, detailed in his book, *Innovation and Entrepreneurship*, identifies various phases of innovation, including the phases of opportunity identification, analysis, acceptability, focusing on core idea, and leadership. The act of innovation, though, is still not clearly explained. Measuring innovation effectively is contingent on understanding details of the innovation process, its inputs and outputs, and its controls.

Measuring innovation is an important issue, as business growth and profitability in the knowledge age depend on innovation. Continual acceleration in innovation will sustain revenue growth, which will then fuel more innovation. Therefore, sustainable growth requires sustainable innovation, which requires that innovation be institutionalized and its output made predictable.

Today, corporations are skeptical of adding new measurements to the existing portfolio of measurements. The current measurements do not, however, get fully utilized through analysis for extracting business intelligence or continually creating new opportunities. Instead, too many companies end up measuring too many things for too little value. Currently a variety of dashboards and scorecards focus more on display instead of extracting intelligence out of the data. Such tools are more appropriate only for data mining. The waste continues to pile up without extracting a proper understanding of the related processes as well as a planned application of the lessons learned from the measurements.

A similar approach is taken regarding the measures of innovation. Several institutions, corporations and consultants are developing measurements of innovation. Some are interested in developing innovation scorecards (e.g., www.petercohan.com, European Business School and Little, 2001) and innovation indexes (innovation radar or innovation dashboards). However, most of the measures lack a consistent definition of innovation and its elements.

As a result, innovation surveys are the most commonly deployed tools to determine an organization's readiness for innovation, its innovation capability, and innovation performance. Several players are trying to bite the innovation apple from different sides. Eventually all these measures will converge when we have a better understanding of the innovation process. Since the understanding of innovation is currently fragmented, so are the measurements.

Recently-conducted research shows that the correlation between various measures of innovation and its impact on the output is somewhat limited. Measuring innovation is

therefore challenging, because current measures do not provide statistical analysis or relate the impact of innovation with any degree of confidence. Measures of innovation are not available for strategic planning because of the uncertainty associated with measures of the financial impact of innovation. Ultimately a lack of financial, organizational, and cultural structure around innovation exists. Research, however, has been done on the effects of innovation on workplace organization (Zoghi, Mohr & Meyer, 2005), corporate performance (Hensen & Webster, 2004; Rogers, 1998), organizational success (Editorial, Rgmag.com, May 2005), and organizational climate (www.cpsb.com, 2002).

Understanding Process Based Measures of Innovation

Based upon the current research, the innovation process has been a fuzzy one at best. In order to establish a set of working measures of innovation, one must identify common characteristics of the innovation process, their inter-relationships, and well-defined deliverables. In order for an innovation process to be standardized, its inputs, in-process activities, and outputs must be identified.

The inputs include elements such as information, tools used in the innovation process, the approach to innovation, and targeted innovation output. The target may be a service, a product, or a certain change in product or service characteristics. According to Gupta's Einsteinian Theory of Innovation (GETI), the innovation depends upon resources, knowledge, play, and imagination. The resources may be headcounts, equipment, or the acquired knowledge itself. The process includes execution, incentives, recognition, collaboration, and research.

The SIPOC (Supplier, Input, Process, Output, and Customer) model can be used for analyzing the innovation process. Table 1, SIPOC Analysis of the Innovation Process, shows various elements of the innovation process. Depending upon an organization's needs, these elements can become the measures of innovation.

Table 1: SIPOC Analysis of the Innovation Process

Supplier (Source)	Input	Process	Output	Customers
Customer, Fundamental research, supply-chain	Demand from customers, Demand defined based on market research, Partner expectations	Establish targets for innovation	Solution for variety of selected and valuable demands	End users, marketplaces, businesses
Customer requirements driven strategic plan, Collaboration Tools	Identified domain expertise or competence, Field of solution, Collaboration process	Teamwork with necessary knowledge base	Collaborative work, Superior output than that of individuals	Organization
Internet based access to research databases, Publications	Variety of information, Benchmarking information	Research the topic	Expanded understanding of the domain and related domains, topic of interest, Exploration	Management, Innovators, Organization, Knowledge repository, Publications or Patents

			capability, Applicable alternate sources of solution	
Knowledge Repository, Innovators, Management	Alternate solutions, Internal capability	Make, "acquire" or "innovate" decision	Commitment to innovate, or acquire	Management, Innovators
Team members, Management, Suppliers, Collaborators	Knowledge, Resources, Environment, Methodology, Tools	Play to innovate	Good ideas, Crazy ideas, Funny ideas, Innovative ideas	Innovators, Team members
Management, Innovators	Culture for Creativity, Good ideas, Crazy ideas, Funny ideas, Innovative ideas	Develop alternate solutions	Evaluation, Performance classification, Patents, Publications	Organization, Patents and Trademark Office
Management, Organizational expectations	Alternative solutions, Organizational Expectations	Select a solution	Product, Service, Process, Platform	Organization, Marketing and Sales
Management, Organization	Performance measures, utilizing the solution	Verify the solution for economic value	Alternate applications, Customer review	Marketing, Sales and Customer
Management	Market leadership intent, Market demand, Resources ($), Target market, Need identification	Develop marketing plans	Market plan to achieve necessary market recognition, Customer's interest	Marketplace, Customers, End users
Management, Resources	Strategic sales plan, Supply chain relationships	Commercialize	Growing product sales, New customer relationships, Sales and Distribution channels	Organization, Society
Management, Process Owners	Implementation of Six Sigma Business Scorecard or equivalent measurement system, Effective data collection	Monitor impact on business performance	Improving measures of innovation in Business Performance Index, Higher Customer Satisfaction	Shareholders, Stakeholders
Inside or outside data sources	Market research, data collection	Assess impact on market capitalization	Improved shareholders' equity, Innovative corporate image	Shareholders, End users
Process owners, Industry sources, Management	Model of Innovation Index, Data collection	Measure Innovation	Innovation Index	Management, Marketplace

The analysis of the innovation process shows many process steps and dozens of measures that can be used for monitoring innovation. The challenge is that people want to devise some magical measures of innovation that can tell the whole story and serve as predictors of innovation. Most management people would like to identify some measures, set targets, provide incentives, and start monitoring them. Even with a better understanding of the innovation process, a lot more thinking still needs to occur before selecting appropriate measures of innovation for an organization.

Given the current understanding of the innovation process, establishing an adequate and accurate measurement system right away is unlikely; instead starting an initial set of measures is a better approach to begin measuring innovation.

For example, if one is developing a process measure to ensure its effectiveness, one needs to look into its inputs, activities and outputs. If one is interested in developing an innovation index for an organization, one must consider factors such as variation between entities and key selected processes of measures. When developing a process measure,

considering its effectiveness in producing the desired result and its relationship with the inputs and activities is essential. In other words, when establishing measures of innovation, establishing a clear objective and purpose for doing so is a must. Once the purpose is defined, and the scope of measures is established, then critical inputs, activities and outputs are identified. Based on the feasibility of data collection already existing or yet to be created, the aggregation of measures and their interpretation, communication, and resultant process adjustments must be thought through in order to select meaningful measures of innovation.

Developing Effective Measures of Innovation

In order to identify innovation measures, understanding the purpose of innovation, its environment, and the input, in-process, and output parameters is essential. Furthermore, the relationships between input and output innovation variables must be implicit. To determine measures of innovation, understanding the role of each process in creating the desired innovation is essential.

An organization attempting to develop measures of innovation must clearly state its objectives before establishing the measures of innovation. Given the presence of a glut of measurements with no use in most organizations, an addition of nice-to-know measures is often perceived as "additional" work and not received well within the organization. Therefore, following are the steps to establish, monitor and act on the innovation measures for a process or an activity:

1. Define the **purpose** of innovation in the organization.
2. Establish expected **deliverables** (basic and specific) and their contribution to business performance, including growth and profitability.
3. Determine the **measures** of success of key deliverables.
4. Identify challenging **opportunities** for improvement in the innovation process.
5. List **activities** that must be performed to accelerate innovation. Identify **input, in-process, and output variables** that are critical to the success of innovation in the organization, and identify measures of goodness of these variables.
6. Determine the **data collection** capability of selected measures of innovation.
7. Establish **reporting** and communication methods, and
8. Monitor (levels and trends) critical and practical measures of innovation
9. Take actions to drive business growth and profitability.

Firm Specific Recommendations

Aggregation of Business Performance Measures:

The Business Performance Index (Gupta, 2003) consists of seven elements and ten measures for monitoring business performance. The seven elements and ten measures are shown in Table 2, BPIn Measures, and include measures for idea management, sales growth, and employee recognition for exceptional improvement. All three of these measures are the measures of an organization's innovation performance at various stages.

The most critical resource with minimal financial impact is the effective intellectual participation of employees in developing innovative solutions as a way of doing work. This requires a robust employee idea management system which can enlist employee ideas daily, filter criteria continually, and escalate the value-driven ideas for improvement or innovation for further implementation.

Table 2: BPIn Measures

Six Sigma Business Scorecard Elements	BPIn Measures
Leadership and Profitability	**CEO Recognition of Employees for Exceptional Value Creation** Corporate Profitability
Management and Improvement	Managing Rate of Improvement
Employees and Innovation	**Employee Ideas for Improvement and Innovation**
Purchasing and Supplier Performance	Suppliers Performance (Sigma Level) Cost of Purchase Goods/Supplies
Operational Excellence	Aggregate Process Performance (Sigma Level) Cycle Time Variance
Sales and Distribution	**Sales for New Products, Services or Solutions**
Service and Growth	Customer Satisfaction (Experience and Loyalty)

CEO Recognition of Employees and Incentives acts as a catalyst for innovation, Idea Management is the process, and Sales of New Products, Services or Solutions is an output of innovation processes at a corporation. Combining these three (or similar) measures to develop a corporate index is simple and allows for the assessment of key aspects. The objective of innovation measures is to provide trends in performance and identify areas for adjustment to accelerate innovation.

Additional Factors to Consider

Having understood the innovation process, measures of innovation, and elements of innovation indices, all that remains is actually implementing an innovation measurement system at one's organization. Simply copying another organization's measures of innovation is not sufficient, as they may reflect different priorities in performance and resource commitment. Table 3, Factors to Consider for Measures of Innovation, lists a variety of measures that can guide thinking in the right direction and facilitate development of appropriate measures of innovation. Good measures of innovation, being specific, measurable, and actionable, catapult the innovation process and produce significantly more innovative outcomes.

Table 3: Factors to Consider for Measures of Innovation

Industry Innovation Indicators	Business Innovation Index	Process Innovation Measures
Innovation Funding, including R&D	Resources – Funding, Culture of Risk Taking, Rewards, Tools	Excellence in Research, Innovation Management, Time allocation (%)
New Products, Services, or Solutions	Activities – Targets for Innovation, Process of Innovation, Extent of Institutionalization, Idea Management, Internal and External Publications, Knowledge Management, Internal and External Collaboration, Recognition	New Idea Deployment, Extent of Improvement or Change, Degree of Differentiation, Disruption or Innovativeness; Time to Innovate
Market Capitalization	Outputs – Patents, New Products, Services or Solutions; Sales Growth, Market Position or Ranking, Customer Perceptions	Rate of Innovation, Savings, Opportunities

Current corporate measures do not include most of the measures of innovation. Innovation, being a new process, evolving towards standardization, difficulties are expected in collecting data for various measures of innovation and benchmarking. However, institutionalizing and measuring the innovation process must start to accelerate innovation in a planned way.

National Measures of Innovation

Following similar analysis, the following measurements can be aggregated into a national index of innovation that would facilitate our national objectives of sustaining economic, social, and political leadership in the world.

M1. Research, Innovation, and Development Funding (RID)
M2. Extent of innovation education in schools and colleges (ISC)
M3. Number of Start ups per year (SPY)
M4. Employee Fun Index (EFI)
M5. National Awareness to Innovate at all levels (NAI)
M6. Creative resources for children (CRC)
M7. New Fundamental and Platform innovations (NFP)
M8. Government Innovation Award Reach (GIA)
M9. Business Innovation Index (BII)
M10. Total New / Lost Job Wages Ratio (NLR)
M11. Per Capita GDP Growth (PCG)
M12. Export/Import Ratio (EIR)

M13. Quality of Life Index (QLI)

Note: Except M1 and M3, measures of innovation are new measures, thus requiring significant change in thinking, commitment, and additional resources.

Committee Specific Information

Proposal Description:

General Description: The proposal presents information about measures of innovation, and makes recommendation about factors to consider primarily for firm specific measures of innovation. The proposal highlights the need for process based, purpose driven measures of innovation instead of just putting together a collection of measures.

Rationale for the proposed change – The rationale for the proposed measures of innovation is to develop measures after understanding of the process of innovation, which is lacking at present. With improved causative relationship between the effort and innovation, it is easier to predict its outcomes. Otherwise, we will have a set of measurement with unpredicted correlation.

Data descriptions, sources and method of collection – Businesses will be establishing new set of measures to facilitate growth that should lead to job creation. However, the business must commit to the fundamental strategy of achieving sustained profitable growth, instead of just make money (profit).

Approximate cost and burden estimate – Today IT tools are available to ease an implementation of new measures of innovation. The harder part will be the understanding of the innovation process at leadership level, and identification of the effective drivers for innovation, which should be to achieve sustained profitable growth,

Impact of Proposal

Proposed improvement – The main improvement is change from product based to process based measurements.

Particular element of measures of innovation – Instead of being randomly selected set of measurements, the measures of innovation are based on all aspects of innovation leading to become better predictor of business innovation.

Issues and questions raised by the committee

1. Current corporate innovation measurement appears to be done primarily on either a project or a portfolio basis. Are these measurement practices sufficiently widespread and uniform to make data collection on either of these practical:

Answer: The proposed measures are different from currently collected measures, thus not uniformly used, however, are uniformly applicable. Yes, it is practical to collect data, however, it will require effort to establish new but important measures.

2. Is it possible or necessary to collect information on company culture, incentive structures, and organizational change?

Answer: Yes, key cultural aspects for promoting innovation are risk taking, employee fun, and employee engagement.

3. If customer satisfaction is an important measure of an innovative firm, how can that be captured?

Answer: Instead of customer satisfaction, customer loyalty is more representative of an innovative firm, it can be measured by monitoring 'repeat business.'

4. How important is it to distinguish between types of innovation (i.e., radical vs. incremental)?

Answer: Yes, it is important to distinguish between types of innovation (fundamental, platform, derivative and variable) in order to allocate sufficient resources.

5. What data would be needed to differentiate the characteristics of innovative firms within industry sectors from non-innovative firms?

Answer: Investment, Innovative products or services, and market capitalization would be representative measures of innovation.

6. What are the most important measures of the underlying process of how innovation and productivity advances are initiated or stimulated?

Answer: Initial measures of the innovation process are CEO recognition, employee ideas, and revenue growth.

7. Could/should an understanding of innovation from the consumer perspective be developed?

Answer: Yes, there must be real-time dialogue with consumer or customers in order to perpetuate innovation. Customer must become part of the innovation process for fast and efficient innovation.

8. Could data from items from SEC filings be used to enhance understanding of innovation in public companies?

Answer: Yes, some measurements may be useful in terms of innovation officer, investments, or revenue growth over longer term.

9. *Are there proxies for relative innovative success* (e.g. percent of total revenue attribute to new or significantly point where they could be considered new – products, services, or process introduced during the last two years into markets where a firm has a growing market share) that would provide insight into relative innovative strength? Is two years long enough?

Answer: Yes, however, since the process of innovation is evolving, new measures must be established. As to the two years for measuring revenue growth for innovation depends upon the type of innovation. For variable and derivative innovations two years may be enough, however, for fundamental and platform innovations two years may not be

enough. Thus it would vary from company to company. Thus a percentage target revenue growth must be established by the company for monitoring innovation strength.

Signals of Changes in business behavior - Innovation Index must be established to monitor changes in business behavior. The simplest index may consist of CEO recognition, employee ideas, and revenue growth.

Sources:

1. Gupta, Praveen, Business Innovation in the 21st Century
2. Gupta, Praveen, Six Sigma Business Scorecard
3. Gupta, Praveen, Six Sigma Performance Handbook

Praveen Gupta, president of Accelper Consulting (www.accelper.com), has worked or consulted with more than 100 organizations worldwide. He has conducted seminars in Singapore, Canada, England, Mexico, Eastern Europe and several cities in the U.S. Praveen has done pioneering work on Business Scorecard, Six Sigma, Business Innovation and Process Management. He has writes monthly columns for www.QualityDigest.com and www.RealInnovation.com. His books include Business Innovation in the 21st Century, Six Sigma Business Scorecard, and Improving Healthcare Quality and Cost with Six Sigma.

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